structure which is surrounded by a ferrite matrix. This structure is called bainite. It is emphasized that *both* pearlite and bainite are mixtures of cementite and ferrite; the difference between them is in the way that the two phases are arranged. The appearance of bainite does not complicate the experiment; we merely record the amount of bainite + pearlite present in the microstructure. Once again the time required for 1, 50, and 99% transformation are recorded and are shown in Fig. 12-19(d) at temperature T_2. The dots indicating the points at which data were acquired have been omitted. The same procedure is then followed for a number of temperatures. When the high-temperature bath is maintained at T_4, martensite begins to appear in the microstructure. The amount of martensite that forms depends on the temperature of the high-temperature bath (T_4 in this case) but is independent of the length of time that the specimen spends in the bath. As the temperature of the bath is decreased, the amount of martensite formed by quenching increases. All of the steel transforms to martensite when the high-temperature bath is maintained at T_5 or lower.

The data gathered from the above experiment can be presented in an orderly, concise manner. The result is the I-T diagram shown in Fig. 12-20. All that has been done is join all of the points in Fig. 12-19(d) for which the transformation

$$\text{Austenite} \rightarrow \text{ferrite} + \text{cementite} \qquad (12\text{-}4)$$

is 1% complete. The line formed by joining these is labeled "1%" in Fig. 12-20. Similarly, the points representing 50% transformation and 99% transformation have been joined and the resulting lines labeled. The

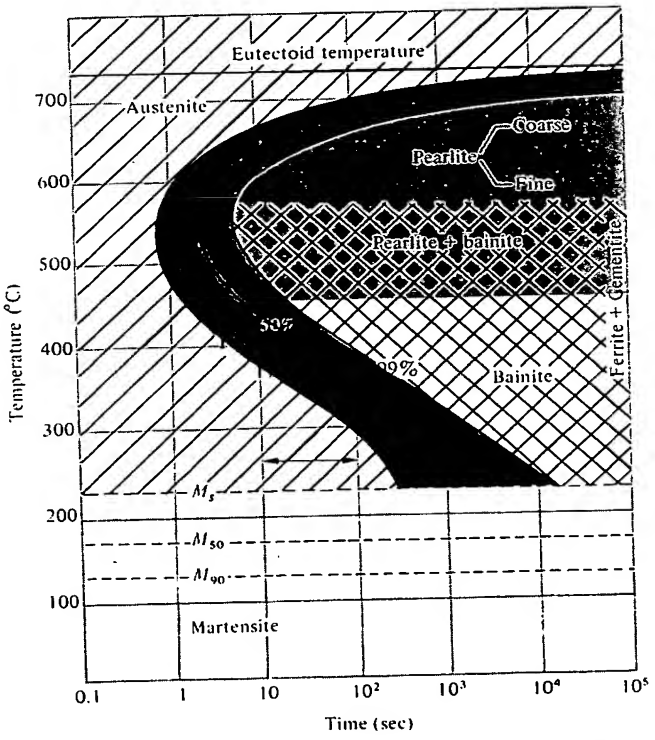

Fig. 12-20. *The isothermal transformation diagram of 1080 steel. It is constructed from data such as those shown in Fig. 12-19. (Adapted from* Atlas of Isothermal Transformation Diagrams, *U.S. Steel Corp., Pittsburgh, 1951.)*